

account of the various positions in which the resonator was placed; of the results obtained with an ordinary Hertzian field between two wires, and round a single wire. The author next considers the *interference* field, which is obtained between two wires whose ends are connected to plates placed on opposite sides of the *same* plate of an oscillator. The effects on an ordinary 2-wire field of bending one of the wires so as to lengthen it by  $\frac{1}{4}$ ,  $\frac{1}{2}$  and a whole wave-length are next investigated. The author shows that all the effects obtained may be deduced from the results obtained with a single-wire field. An account of some experiments with 3, 4 and 6 wires concludes this chapter.

Chapter iv. deals with the action of the resonator. The effects of varying the position and direction of the micrometer-gap, the disturbance due to the presence of the resonator in the field, and the effect of varying the length of the resonator are studied in detail. The form of resonator with a gap bridged over by a cell and telephone receives careful attention, the effect of altering the position of the gap relatively to the micrometer spark-gap being fully investigated.

Chapter v. is concerned with the important problem of the propagation of waves in dielectrics other than air. Oil and water were the two dielectrics studied by the author, and the effects obtained clear up some rather obscure and apparently contradictory results obtained by other experimenters in this field.

Chapter vi. contains a useful *résumé* of the more important results obtained by the author.

In Chapter vii. the author describes a system of multiplex Hertzian wave telegraphy (*not* wireless), regarding whose practical value we may well be pardoned for feeling somewhat sceptical.

The book forms a valuable storehouse of facts, and the author is to be congratulated on the extremely lucid and well-arranged account of his important researches. They were all carried out on a large scale (in the experiments on oil and water, 230 to 260 litres of the liquid were used), and must have required an unusual amount of skill, care and patience.

A striking feature of the work is the entire absence of mathematical reasoning, not a single symbol of differentiation or integration occurring throughout the whole of the book. The author has carefully avoided all theoretical discussions, and confined himself to an accurate description of experimental facts. The clearness and elegance of the language in which this description is given render it a pleasure to read the book, which will prove a source of delight to every true experimentalist.

#### OUR BOOK SHELF.

*Indicators and Test Papers.* By Alfred I. Cohn, Ph.G. Pp. ix + 249. (New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 1899.)

THIS book contains an account of the source, preparation, application and tests for some scores of indicators and test papers which have been proposed for use chiefly in determining the end-point in volumetric chemical analyses. The book opens with a general discussion of the action, use, and theory of indicators, and ends with four useful tables and a good index. The first table is

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Trommsdorff's showing the sensitiveness of indicators to acids and alkalis, the second is R. T. Thomson's (hitherto the chief English guide), the third is Dieterich's table showing the sensitiveness of various test-papers, and the fourth is a tabular summary of the principal indicators by the author.

The compilation of this book must have demanded much patient labour, and acknowledgments are due to the author for the care and pains he has bestowed upon the work. It will prove a useful addition to analytical literature. Whilst saying this, some points of criticism cannot be withheld. In the first place it must be said that the author has not dealt in a very clear way with the theory of indicators. The subject is not an easy one, and the average operator has not hitherto troubled himself much about it. Litmus has been to him a substance provided by Nature for the discrimination between acids and alkalis rather than the means of furnishing blue alkaline salts from which a weakly acidic substance of red tint is "displaced" by the action of nearly all other acids. Again, the reasons why methyl orange is good for the titration of bases and not of acids is not usually inquired into. Such considerations make it the more desirable that the principles underlying the use of indicators should be stated very clearly. Mr. Cohn has given explanations, including the application of the ionic theory, and of the speculative mechanical theory (somewhat antiquated and unfruitful) of F. Mohr, but he has not set forth the matter with the desirable clearness and coherence.

Next with regard to the substance of the book, it is worth considering whether, in any future edition, type of two sizes might not be employed. Many of the indicators described are of extremely doubtful value, and the worker really wants to know definitely which indicators have been found meritorious by other people than those who have suggested their use. In this connection also a protest must be raised against naming indicators after their inventors. It is useful to know the composition and nine synonyms of Tropæolin OO, but there is surely no call to add to these the term "Von Müller's Indicator."

The book would have been improved by references to original papers. For example, the reflecting galvanometer is scheduled as an indicator, but there is neither a full description of its use nor a reference to Küster's paper on the subject. References would have been valuable throughout the book.

A. S.

*Optical Activity and Chemical Composition.* By Dr. H. Landolt; translated by Dr. J. McCrae. Pp. xi + 158. (London: Whittaker and Co., 1899.)

THIS small book is a remarkably clear exposition of what is a somewhat recondite and difficult branch of chemical physics. It is well known to students of optical science that there are liquids and solid substances in solution which have the strange power of rotating the plane of vibration of a polarised ray of light that is passing through them. Familiar examples are turpentine and other essential oils, sugars, tartaric acid, quinine and albumen. But Dr. Landolt says that more than seven hundred substances, all carbon compounds, are known to exhibit this molecular rotation.

Of course the fruitful discoveries of Pasteur—the right and left-handed tartaric acids, racemic acid, molecular asymmetry, &c., are briefly described; and the more recent simultaneous discoveries of van't Hoff and Le Bel receive fuller attention. It is shown how this property is met with only where one at least of the carbon atoms of an organic compound is united with four different atoms or radicles; and the results flowing from this kind of structure are explained and illustrated—results which form what is now called stereochemistry.

But the principal object of Prof. Landolt's book, as expressed in its title, is the connection that may be found

o exist between the chemical constitution of a substance and the degree of its rotation. The fact that such relations do exist in the case of other optical properties, such as molecular refraction, dispersion, and magnetic rotation, no doubt gave rise to the expectation that some similar connection would be found in regard to this rotatory power. In the above cases the optical differences depend mainly on the nature and number of the elements composing the substance, though modified to a certain extent by the manner of combination. But here it seems to depend almost entirely on the mode of grouping. Such able experimenters as Guye, Chavanne, Walden, Tchúgaëff, Nasini, van't Hoff, and in our own country Frankland and Crum Brown, have investigated the question. The problem has not yet been solved; but a number of suggestive results have been obtained which will no doubt lead to further research, and the clearing up of the relationships between composition and amount of rotation which unquestionably do exist.

J. H. G.

*Science and Faith; or Man as an Animal and Man as a Member of Society: with a Discussion of Animal Societies.* By Dr. Paul Topinard. Translated from the Author's Manuscript by Thomas J. McCormack. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1899.)

THE editors of the *Monist*, some four years ago, invited discussion on the main problems of the philosophy of science and the reconciliation of science and faith. This book is Dr. Topinard's answer—the longest and fullest received—to their question. Man is regarded from the standpoint of anthropology; at the outset a creature merely selfish, but ultimately actuated by the sense of duty to the community. Thus he is a battlefield of opposing influences, egoism and altruism. Can we then explain the development of the latter on scientific principles, or must we have recourse to some external influence or impulse; in other words, assign a part to faith. In a series of chapters the author sketches man's development, as a member not only of the animal kingdom, but also of societies, seeking to trace in the lower forms of life the rudiments both of structures and of ideas. Finally, he arrives at the conclusion that Science and Faith mutually exclude each other. This perhaps would be generally admitted, even by those who would maintain that neither science nor faith alone could give a complete explanation; for each investigates different aspects of the problem and by a different method. Thus far the two are exclusive; nevertheless both may be necessary in order to obtain complete knowledge. For on many minds a problem presses to which Dr. Topinard offers no reply, namely, "Why" is all this? What is the cause of all these phenomena? Of what kind of power are they an expression? To answer this, he might reply, is not the province of science. That may be true, but the question remains, and not a few hold that to ignore it is an arbitrary narrowing of the field of investigation. In other words, whether Dr. Topinard's book will or will not satisfy inquirers is very much a question of temperament. Grant certain postulates—for such they are, and not axioms—in regard to the field of investigation, and it will; repudiate them, and it will not. He maintains "that the two domains of science and faith are two contrary poles"; others will say that each is necessary if a globe is to be complete, and that a very large zone exists between the circumpolar regions in which each of these apparent opposites plays a part, now the one, now the other dominating. But the book is worth reading, whether we are or are not satisfied with its conclusions, whether we regard it as a real or only a forensic success.

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*Who's Who.* 1900. *An Annual Biographical Dictionary.* Pp. xviii + 1002.

*The Englishwoman's Year-Book and Directory.* 1900. Edited by Emily James. Pp. xxi + 340. (London: Adam and Charles Black, 1900.)

"WHO'S WHO" is now in its fifty-second year of issue and as a handy work of reference containing biographical particulars and addresses of persons of greater or less prominence in science, art, and literature it stands alone. Tested by several years of use, the publication has been proved to be a dictionary of biography which can be referred to with confidence. Science is fairly well represented, every Fellow of the Royal Society from whom particulars could be obtained being included, and also other workers in the scientific world. A complete list of Fellows of the Royal Society is given among the useful miscellaneous information which precedes the biographical sketches. Curiosity induced us to see how many of these names also occur in the list of members of the Privy Council, and we found that although 25 of the 265 members of the Council have been admitted into the Royal Society, only two or three can with the most liberal interpretation be considered as engaged in scientific work.

"The Englishwoman's Year-Book" shows the numerous opportunities which now exist for women to exercise their activities, and testifies to the abundant use made of them during last year. There are fourteen sections, each concerned with opportunities and progress in a particular branch of work, among them being education, medicine, and science. Under the latter head is given lists of scientific articles and papers contributed by women to magazines and learned societies during last year, and also of women science lecturers and demonstrators. The volume should be of service in promoting the best interests of women by exhibiting their intellectual accomplishments.

*Le Phénomène de Zeeman.* Par A. Cotton. Pp. 100. (Paris: Georges Carré and C. Naud, 1899.)

THIS is the fifth number of the physical series of "Scientia," under which title is appearing a collection of handy volumes dealing with recent advances in science, and intended primarily to enable specialists in one department to keep themselves abreast of the times in regard to the work being done in other departments. A concise account of the Zeeman phenomenon will be valuable to many.

M. Cotton has limited his treatment to the experimental aspect of the phenomenon. He commences with a summary of recent progress in spectroscopy, and of the different causes which tend to modify the spectral rays. The history of Zeeman's discovery is then introduced, and in the next chapters M. Cotton discusses the changes in the rays emitted parallel and perpendicular to the lines of force, and the absorption effects dependent on the Zeeman phenomenon. In the last chapters M. Cotton describes the experiments of Righi, of Macaluso and Corbino, and of Voigt. The author is to be congratulated on the amount of information he has been able to convey in so small a compass.

*Dictionnaire des Termes de Médecine, Français-Anglais.* By H. de Méric. Pp. vi + 243. (London: Baillière, Tindall and Cox, 1899.)

THE English-French part of this dictionary has already been noticed (vol. lix. p. 484). We hardly see the necessity of giving, in a technical dictionary, the English equivalents of such common words as civilisation, classe, concave, doctrine, division, idée, intelligence, reptile, visage, nuit, and many others. This, however, will not make the volume any the less serviceable to physicians and students of medicine.